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LISTS OF SPECIES

Angiosperm flora from wetlands of Kanyakumari district, Tamilnadu, India

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ABSTRACT: Qualitative floristic surveys were carried out during 2007-2009 in the wetland ecosystem of Kanyakumari district, Tamilnadu, India. During the survey, 124 species of angiosperms belonging to 31 families and 81 genera were documented. Dominant families were Poaceae with 39 species followed by Cyperaceae (24), Scrophulariaceae (9), Commelinaceae (5), Acanthaceae and Convolvulaceae (4 speceis each) and Hydrocharitaceae and Verbenaceae (3 species each.) Ten families were represented by two species each, whereas thirteen families were monospecific. Of the 124 species, there are 21 dominant Pantropical species, 15 subdominant Asiatic species and 11 co-dominant Indian species. Five species are endemic to Southern Western Ghats.

INTRODUCTION

Wetlands are defined as lands transitional between terrestrial and aquatic eco-systems where the water table is usually at or near the surface or the land is covered by shallow water (Mitsch and Gosselink 1986) and it occupies 4-6% of the earth's land area (Matthews and Fung 1987; Aselmann and Crutzen 1989). Wetlands in India that occupy 58.2 million hectares (including areas under wet paddy cultivation), face tremendous anthropogenic pressures such as rapidly expanding human population, large scale changes in land use/land cover, burgeoning development projects and improper use of watersheds, which in turn greatly influence the aquatic biodiversity (Prasad *et al.* 2002; Singh *et al.* 2006; Kumar and Gupta 2009; Alexander *et al.* 2010; Anand *et al.* 2010; Chackacherry 2010; John and Francis 2010; Kannan and Arun Raja 2010; Prasad 2010; Ramachandra 2010; Rasingam 2010).

Kanyakumari, a district with unique environment receives two monsoons and it supports rich repertoire of wetlands (Kiruba *et al.* 2010), small and big, lentic and lotic, natural and manmade, adding freshness to the pristine beauty of the district. These areas which are occupied by aquatic and shore vegetation that establish strong association between aquatic and terrestrial ecosystems, which play a significant role in the primary production, nutrient cycling, and serve as bioindicators for eutrophication processes (Scheffer 1998; Ahila Angelin *et al.* 2010; Araujo *et al.* 2010; Eyarin Jehamalar *et al.* 2010a-c; Indirani 2010; Lawrence 2010; Mary Christi *et al.* 2010; Packia Raj 2010; Reginald 2010; Regini Balasingh 2010; Satya and Sangeetha 2010; Thangam *et al.* 2010; Vasantha 2010). However, little attention has been paid to the systematic study on aquatic and wetland plants of Kanyakumari district (Sukumaran and Raj 2009; Sathia Geetha *et al.* 2010; Sukumaran *et al.* 2010). Consequently, botanical explorations of wetland plants are necessary to gain more knowledge on species richness as well as their geographical distribution. In view of this fact, the present study is meant to prepare the checklist of wetland plants of Kanyakumari district, the first exploration of the kind in this area.

MATERIALS AND METHODS

Study area

Kanyakumari district (77°07' – 77°35' E, 08°05' – 08°35' N) is a part of Western Ghats, and it occupies an area of about 1672 sq. km. and is inhabited by 11,37,181 people (Figure 1). The rainfall varies from 103 cm to 310 cm and altitude is about 1829msl (Raj, 2002). Most of the district is composed of gneissic rocks (Foote 1884). The soils are red varying in their quantity of their ferruginous element.

Topographically this district may be broadly classified as coastal region, middle region and mountainous region. The coastal region, which stretches from south east to west, has small township like Anjugramam, Puthalam, Thamaraikulam, Vattakottai etc., on the southeast and Colachel, Muttom, Thengapattanam etc., on the West Coast.

Middle region (plains) contains large number of wetlands and irrigation canals showing the richness of hydrophytes, which provides a wintering and staging ground for a number of migratory waterfowls and a breeding ground for resident birds. Small townships are surrounded by paddy fields. Coconut, banana, mango and jack fruit are some of the commonly cultivated plants.

The mountainous region of the Southern Western Ghats provides a continuous wall along the northern side of the district. Many estates of Rubber, Cardamom, Tapioca etc., are present in this hilly ranges (Henry and Swaminathan 1981).

Floristic survey

An extensive floristic survey was conducted during the year 2007-2009. The plant specimens were collected at different reproductive stages to prepare herbarium specimens and authenticate their correct identity. The

collected specimens were identified taxonomically with the help of available monographs, taxonomic revisions and floras (Hooker 1872. 1984; Gamble and Fischer 1915-1935; Henry and Nair 1983 - 1989; Mohanan and Henry 1994; Santapau and Henry 1994; Kabeer and Nair 2009) and by using the field keys devised by Subramanyam (1962). Collected specimens were cross checked for correct identification at the Herbarium of Tropical Botanical Garden and Research Institute, Trivanduram, Kerala and Botany Department of Nesamony Memorial Christian College, Marthandam.

Lists of endangered, rare and endemic plants found in the wetlands was prepared with the help of published works of IUCN (1980, 1994), Nayar and Sastry (1990), Nayar (1996) and Subbarayalu and Velmurugan (1999). Phytogeography of the floristic elements were analysed by usig the literature available (Parthasarathy 1988; Pareek and Sharma 1988; Bharucha and Meher-Homji 1965; Basha *et al.* 1992; Chatterjee 1939; Kabeer and Nair 2009). The voucher specimens were prepared by using the standard methods given by Martin (1995) and deposited in the herbarium (NMCCH) of Nesamony Memorial Christian College Marthandam, Kanyakumari, Tamilnadu, India.

Ecological Classification

The common habitats of hydrophytes and marshy vegetation are in the ponds, tanks, rivers, dams, canal banks, ditches, low-lying water-logged areas, rice fields are ideal habitats for many aquatic, semi aquatic wetland and marsh plants (Figures 2, 3 and 5). Seasonal puddles and ditches are scattered through out the district, more commonly along the interior of the villages. They get filled up with water during the monsoon season and dry in a short period, while in others, water may persist for a considerably long time. In the forest, the hill swamps and streams support a different type of aquatic vegetation. In plains, the low-lying paddy fields form important habitat for hydrophytes of different groups. In Kanyakumari district, almost all the water resources are occupied with various types of macrophytes (Figure 4) viz. free floating, floating, submerged, rotted shoreline etc, which are an integral part of the ecosystem and act as bio-filters. The five life forms of hydrophytes of the district can be classified depending upon their nature, habits, conduct with water, soil, air and light.

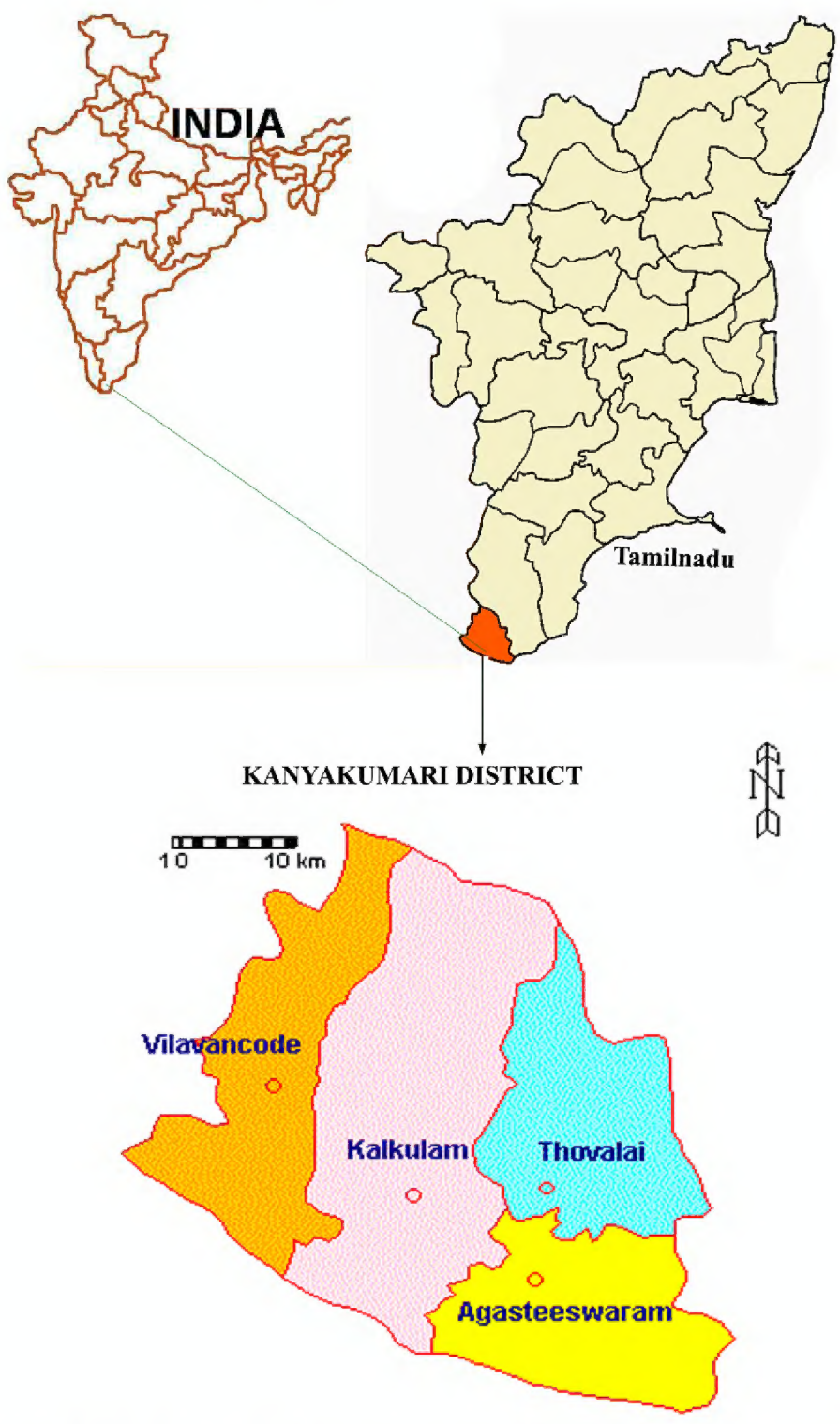

Figure 1. Map showing the study sites, wherein aquatic angiosperms were documented during 2007-2009 at Kanyakumari District, Tamil Nadu, India.

a) *Free floating hydrophytes*: Commonly seen in stagnant water bodies, slow flowing water and are in conduct with only water, air, and light. Such species typically float on water surface with extensive root system. Some taxa are large stoloniferous, with rosetters of aerial or floating leaves and well developed submerged roots. Very often these species occur in pure communities and completely cover up the water surface where favorable conditions exist.

b) *Submerged hydrophytes*: Generally, in such species the foliage is entirly submerged, conduct with soil or rock but their reproductive parts are raised slightly above the water level.

c) *Fixed floating hydrophytes*: These types of plants are in contact with soil, water and air. Some of the plants occur on soft wet muddy substratum or root-in water surface and are in contact with soil, water and air, even after the substratum is considerably dried up.

d) *Amphibious hydrophytes*: Commonly occur on exposed or submerged soils where the water table is beneath the soil surface. These plants are adapted to sustain in both aquatic and terrestrial modes of life. The aerial parts of these amphibious hydrophytes are with mesophytic characters and the submerged parts shows true hydrophytic characters. Many of these thrive well even after the substratum is considerably dried up.

e) *Marshy and wetland hydrophytes*: These are also known as 'border line' plants in this category and the soil is usually saturated with water atleast in the early part of the plant life. They occur in moist rice fields, bank of water bodies, marshy and wet areas near human habitation. Large number of herbacious taxa included the vegetation of such habitats. They are frequently observed with in wet rice fields, along hill swamps, streams in forests and marshy localities. Many grasses and sedges are enumerated quantitatively significant.

Besides, it is difficult to ascertain to which particular category an aquatic wetland plants belong, since the same plant may also grow and behave differently in a changed situations (Maliya 2006). Floating hydrophytes like *Pistia stratiotes* and *Eichnornia crassipes* may also grow as emergent forms or same borderline species send out floating shoots on the surface of water. Some floating plants with extensive root system may become anchored

in shallow water. Several species produce life-forms when stranded on marginal wet soil. However the taxa like *Clerodendrum inerme, Stachytarpheta jamaicensis, Commelina benghalensis Alpuda mutica, Chloris barbata, Cynodon dactylon etc.* thrive well even without water, stagnent or dried wet areas, the roots are anchored the soil. Growth of aquatic and wetland vegetation occurs in a number of water bodies, consequently these still and shallow reservoirs of water with clay bed nourish a large variety of aquatic and wetland species in and around them.

Results and Discussion

Species diversity

During the study 124 species and 81 genera belonging to 31 families were recorded from the wetlands of Kanyakumari district (Table 1). Of these monocots are represented by 80 species belonging to 47 genera and 11 families, while dicots contributed by 44 species belonging to 33 genera and 21 families. Beside these, marshy and wetland plants contribute 71 species under 48 genera and 19 families; amphibious plants represented by 31 species and 22 genera with 10 families; fixed floating (12 species with 9 genera and 9 families); submerged (6 species and 5 genera under 3 families) and free floating (4 species represented by 3 genera and 3 families) (Figue 5).

Families with maximum number of species include Poaceae with 39 species followed by Cyperaceae (24), Scrophulariaceae (9), Commelinaceae (5), Acanthaceae and Convolvulaceae (4 speceis each) and Hydrocharitaceae and Verbenaceae (3 species each). Ten families namely, Amaranthaceae, Araceae, Asteraceae, Lemnaceae, Lentibulariaceae, Menyanthaceae, Nymphaeaceae, Onagraceae, Polygonaceae and Pontederiaceae were represented by two species each, whereas thirteen families (Apiaceae, Asclepiadaceae, Boraginaceae, Eriocaulaceae, Molluginaceae, Nelumbonaceae, Pandanaceae, Papilionaceae, Podostemaceae, Rhizophoraceae, Rubiaceae, Trapaceae and Typhaceae) were monospecific (Table 2).

Diversity of grasses and sedges

Grasses are widespred than any other family of flowering plants of the world and represented by 10,000 species 261 genera (Karthikeyan 2005). As in the case of any aquatic ecosystem, monocots dominate the vegetation having more species diversity in contrast to terrestrial habitats. Poaceae (Grasses), Cyperaceae (sedges), Scrophulariaceae and Commelinaceae with 39, 24, 9 and 5 species respectively dominate the wetland vegetation of the presently studied area.

The species *Apluda mutica, Branchiaria mutica, Chloris barbata, Cynodon dactylon, Eleusine indica, Eragrostis unioloides, Eriochloa procera, Hygroyza aristata, Isachne miliacea, Jschaemum indicum, J. trimorense, Leersia hexandra, Oplismenus compositus, Orysa meyeriana, Oryza sativa, Paspalidium geminatum, Paspalum canjucatum, P. scrobuculatum, Pennisectum polystachyon, Sacciolepis indica, S. interrupta, Setaria intermedia* and *Sporobolus indicus* may be served as fodder grassess for poultry. These species are collected in the growing season, and also grazed by cattles. *Saccharum spontaneum* and *Sporobolus maderaspatanus* are grasses which reduce the pressure of flood, and prevent soil erosion. *Cynodon dactylon* of the tribe Chlorideae is used as fresh fodder in the study area and *Axonopus compressus* is used as carpet grass. As it is evident that in the area mostly grasses are used as fodder, some are used for other purposes such as thatching and medicinal ailments and few are the serious weeds of the cultivated wetland field (Meena *et al.* 2010). *Oryza meyeriana* and *Oryza sativa* are collected in the growing season and are stored for winter use. *Oryza sativa* is a staple food source of the State, cultivated in many areas with better rainfall or irrigation facilities including places nearby river, ponds, water logged areas and other wetlands. Feeds of high quality can be made from several species of aquatic plants (Baily 1965). Species like *Setaria verticillata, Hygroryza aristata* grains are known to be used by tribal communities.

Cyperaceae with its wide range of distribution and habit adaptability found a place even in the Pre-Linnaean contribution. It includes 24 species and 6 genera. An analysis has revealed that most of the species of Cyperaceae belongs to Penninsular India, while *Cyperus brevifolius, C. difformis, C. rotundus, Elecocharis* sps., *Scirpus lacustris* etc. are cosmopoliton and *Cyperus compressus, C. iria, C. unioloides, Fimbristylis dichotoma, F. miliacea, Rhynchospora corymbosa* are pantropical, the rest are more or less restricted in distribution, and show a strong affinity to the flora of Tamil Nadu, India, South east Asia and China. Several species of *Cyperus, Eleocharis, Fimbristylis* and *Scirpus* are frequently found as weed and they have a very wide range of distribution in the tropics India, China, Japan, South East Asia, Australia, Africa and America. The present study agrees with the finding of Rao and Varma (1982) that these plants are in the wide range of distribution.

Rare, endemic and threatned taxa

Five rare, endemic and threatened species were collected during the present study. Two species namely *Alocasia macrorrhizos* and *Kyllinga squamulata* are the new distributional record for the flora of Tamil Nadu. The rare and endemic plants (*Commelina hasskarlii, Cyrtococcum longipes, Indotristicha ramosissima* and *Eriochrysis rangacharii*) have also been collected from the wetlands of the study area. The present collection clearly indicates that wetlands are conservation pockets of some rare and endemic plants.

The species *Eriochrysis rangacharii* is endemic to Tamil Nadu (Kabeer and Nair, 2009), collected earlier by Lady Burne on 1990. There was no further information about this grass after that and it was presumed to have become extinct (Nagar and Sastri 1987). Recently it was rediscovered from Korekundah in Nilgiri district of Tamil Nadu (Puyravaud *et al.* 2003). *Commelina hasskarlii* belonging to the family Commelinaceae, endemic to Tamil Nadu (Henry *et al.* 1989) has also been reported from the present study area.

Phytogeography of enlisted elements

Geographic distribution of terrestrial plant species is often limited by climatic factors, by competition with species that perform better under their local environment and by the reduced reproductive success of range limit

populations (Garcia *et al.* 2000). In the present survey, a total of 124 angisopermic species has been enlisted and they comprise the elements of thrity four floristic regions. Pantropical elements were the dominant ones, with 21 species, and the Asiatic elements, with 15 species, occupy sub dominant position followed by the 11 co-dominant Indian species, eight cosmopolition, seven tropical indo-African species, six Asiatic and Australian species, five endemic species (Western Ghats), and five Asiatic and Afirican species. Altogether these groups comprised almost 63% of the vegetation and showed that aquatic plants tend to have broader distribution than their terrestiral counterparts. However, broad distributional ranges require high dispersal rates, particularly in combination with limited life span of lakes and wetlands on geological and evolutionary time scale (Hutchinson 1975; Wetzel 1988; Santamaria 2002). Morever high proportion of widly distributed taxa among the aquatic plants may be due to uniformity of the aquatic environment, widespread clonality, high phenotypic plasticity, ecological factors, and climate in particular. These factors are known to constrain the distribution of plant species, resulting in large vegetation zones (Walter, 1973). It can be argued that the rest of the species ~~down~~ came from the neighbouring phytogeographical domains. Jordan (2001) pointed out that geographical barriers and patterns of long - distance dispersal are often referred to as contributors to the distribution of aquatic flora.

Jacobs and Wilson (1996) concluded that the exisiting distributional patterns are best explained by a combination of dispersal vicariance and local speciation. They observed a major disjunction between the tropical and temperate aquatic, floras, attributed to a climatic barrier and more clearly defined at the species, the genus level than at the family level. In addition, geographically close areas within the tropical or temperate zones had more similar floras, indicating limited dispersal of species across large distance or through geographic barriers (Jacobs and Wilson 1996), for the reason being the phytogeographical richness of the study area. It may also be due to its unique geographical locations where different climatic zones are appearing to the merged with one another. Chatterjee (1939) reported that Indian climatic conditions have permitted penetration of many Pantropical, Asiatic, Indo-Malayan, Cosmopolitan and other elements from neighbouring countries and the country has lost its original endemic status. However aquatic vascular plants also show limited taxonomic differentation. It is possible to prove by the application of new taxonomic criteria and tools that broadly distributed species will be composed group of sibling species. However sibling species still have wide geographic ranges. Further, the study area is located very close to the Sri-Lanka (the sea in the west and south of this isolated geography) and bounded by sea and mountain. Several species of pantropical, Asiatic and Indian, Cosmopoliton tropical Indo-African, Asiatic and Australian etc. elements have entered and integrated in its vegetation. Sculthorpe (1967) identified 60% of recorded hydrophytes as having extensive world wide ranges, while 40% confined to a single continent. The present study also revealed that the remaining floristic elements like Asiatic Africa American, Asiatic American, Indo tropical African, Asiatic Indo-Malayan, Indo-Malayan Sri-Lankan etc. occupied a low position, compared to the above with world wide distribution. The latter appears to be the case for the wetland plants of Kanyakumari district is under study.

Table 1. List of wetland angiosperms from Kanyakumari district, Tamilnadu, India

Sl. No	BOTANICAL NAME	FAMILY	FLOWERING AND FRUITING
1	*Acanthus ilicifolius* L.	Acanthaceae	December-April
2	*Aeschynomene aspera* L.	Papilionaceae	July-November
3	*Alloteropsis cimicina* (L.) Stapf	Poaceae	September-November
4	*Alocasia macrorrhizos* (L.) G. Don.	Araceae	December - March
5	Alternanthera sessilis *(L.) Br.*	Amaranthaceae	Throughout the year
6	*Amaranthus roxburghianus* Nev.	Amaranthaceae	January-April
7	*Apluda mutica* L.	Poaceae	Throughout the year
8	*Asystasia gangetica* (L.) T. And.	Acanthaceae	January-March
9	*Axonopus compressus* (Sw.) P. Beauv.	Poaceae	April-March
10	*Bacopa monnieri* (L.) Penn.	Scrophulariaceae	October-February
11	*Brachiaria mutica* (For.) Stapf	Poaceae	November-March
12	*Centella asiatica* (L.) Urban	Apiaceae	March-August
13	*Centipeda minima* (L.) A. Braun and A.	Asteraceae	Throughout the year
14	*Chloris barbata* Sw.	Poaceae	Throughout the year
15	*Clerodendrum inerme* (L.) Gae.	Verbenaceae	December-May
16	*Commelina benghalensis* L.	Commelinaceae	Throughout the year
17	*Commelina diffusa* Burm. f.	Commelinaceae	September-January
18	*Commelina erecta* L.	Commelinaceae	December-April
19	*Commelina hasskarlli* Cl.	Commelinaceae	January-March
20	*Cynodon dactylon* (L.) Pers.	Poaceae	Throughout the year
21	*Cyperus arenarius* Retz	Cyperaceae	January-March
22	*Cyperus brevifolius* (Rottb.) Has.	Cyperaceae	January-October
23	*Cyperus cephalotes* Vahl.	Cyperaceae	September-March
24	*Cyperus compressus* L.	Cyperaceae	December-May
25	*Cyperus corymbosus* Rottb.	Cyperaceae	Throughout the year
26	*Cyperus difformis* L.	Cyperaceae	September-April

Table 1. ***Continued.***

Sl. No	BOTANICAL NAME	FAMILY	FLOWERING AND FRUITING
27	*Cyperus digitatus* Roxb.	Cyperaceae	October-March
28	*Cyperus exaltatus* Retz.	Cyperaceae	November-March
29	*Cyperus halpan* L.	Cyperaceae	November-March
30	*Cyperus hyalinus* Vahl.	Cyperaceae	November-April
31	*Cyperus iria* L.	Cyperaceae	November-April
32	*Cyperus nutans* Vahl.	Cyperaceae	Throughout the year
33	*Cyperus paniceus* (Rottb.) Boe.	Cyperaceae	January-August
34	*Cyperus polystachyos* Rottb.	Cyperaceae	Throughout the year
35	*Cyperus rotundus* L.	Cyperaceae	Throughout the year
36	*Cyrtococcum longipes* (Wt. H.f.) A.	Poaceae	November-February
37	*Dacytloctenium aegyptium* (L.) Willd.	Poaceae	January-April
38	*Digitaria abludens* (R. and Sch.) Veldk.	Poaceae	September-February
39	*Digitaria ciliaris* (Retz.) Koeler.	Poaceae	September - March
40	*Eclipta prostrata* (L.) L.	Asteraceae	Throughout the year
41	*Eichhornia crassipes* (Mart.) S.L.	Pontederiaceae	September-December
42	*Eleocharis spiralis* (Rottb.) Roe.	Cyperaceae	July-December
43	*Eleusine indica* (L.) Gaertn.	Poaceae	October-December
44	*Eragrostis aspera* (Jacq.) Nees.	Poaceae	Throughout the year
45	*Eragrostis japonica* (Thu.) Trin.	Poaceae	November-February
46	*Eragrostis tenella* (L.) P. Bea.ex Roem. and Sch	Poaceae	July-February
47	*Eragrostis unioloides* (Retz.) Ness.	Poaceae	July-January
48	*Eriocaulon thwaitesii* Koe.	Eriocaulaceae	July-August
49	*Eriochloa procera* (Retz.) C.E Hubb.	Poaceae	September - January
50	*Eriochrysis rangacharii* Fischer	Poaceae	October-December
51	*Fimbristylis aestivalis* (Retz.) Vahl.	Cyperaceae	May - December
52	*Fimbristylis argentea* (Rottb.) Vahl.	Cyperaceae	November-April
53	*Fimbristylis dichotoma* (L.) Vahl.	Cyperaceae	July-October
54	*Fimbristylis ferruginea* (L.) Vahl.	Cyperaceae	November-March
55	*Fimbristylis miliacea* (L.) Vahl.	Cyperaceae	September-November
56	*Hedyotis corymbosa* (L.) Lam.	Rubiaceae	July-October
57	*Heliotropium indicum* L.	Boraginaceae	Throughout the year
58	*Hydrilla verticillata* (L. f.) Roy.	Hydrocharifaceae	September - January
59	*Hygrophila auriculata* (Sch.) Heine	Acanthaceae	September - January
60	*Hygroryza aristata* (Retz.) Ness.	Poaceae	September - January
61	*Indotristicha ramosissima* (Wt.) Roy.	Podostemaceae	October-January
62	*Ipomoea aquatica* Forssk.	Convolvulaceae	September-December
63	*Ipomoea carnea* Jaeq.	Convolvulaceae	September-December
64	*Ipomoea obscura* (L.) Ker. G.	Convolvulaceae	January-March
65	*Isachne miliacea* Roth.	Poaceae	November-April
66	*Ischaemum timorense* Kunth	Poaceae	January-March
67	*Ischeamum indicum* (Houtt.) Merr.	Poaceae	November-April
68	*Kyllinga squamulata* Vahl.	Cyperaceae	October-March
69	*Leersia hexandra* Sw.	Poaceae	October-December
70	*Lemna gibba* L.	Lemnaceae	October-December
71	*Lemna perpusilla* Torrey	Lemnaceae	February-April
72	*Limnophila heterophylla* (Roxb.) Ben.	Scrophulariaceae	October-January
73	*Limnophila indica* (L.) Dru.	Scrophulariaceae	October-January
74	*Lindenbergia indica* (L.) Kun.	Scrophulariaceae	October-April
75	*Lindernia antipoda* (L.) Al.	Scrophulariaceae	July-December
76	*Lindernia caespitosa* (Bl.) Pan.	Scrophulariaceae	June-September
77	*Lindernia crustacea* (L.) F.V.Mul.	Scrophulariaceae	March-August
78	*Lindernia oppositifolia* (Retz.) Muk.	Scrophulariaceae	August-September
79	*Ludwigia adscendens* (L.) Hara	Onagraceae	Dec.-March
80	*Ludwigia perennis* L.	Onagraceae	November-March
81	*Merremia hederacea* (Burm. f.) Hf.	Convolvulaceae	October-March
82	*Mollugo pentaphylla* L.	Molluginaceae	Throughout the year
83	*Monochoria vaginalis* (Burm. f.) C. Presl ex Kunth.	Pontederiaceae	September-December
84	*Murdannia pauciflora* Bru.	Commelinaceae	November-April
85	Nelumbo nucifera *Gaertn.*	Nelumbonaceae	April-July
86	*Nymphaea nouchali* Burm. f.	Nymphaeaceae	Throughout the year
87	*Nymphaea pubescens* Willd.	Nymphaeaceae	Throughout the year
88	*Nymphoides hydrophylla* (Lour.) K.	Menyanthaceae	Throughout the year

Table 1. *Continued.*

Sl. No	BOTANICAL NAME	FAMILY	FLOWERING AND FRUITING
89	*Nymphoides indicum* (L.) Kuntze	Menyanthaceae	November-April
90	*Oplismenus compositus* (L.) P. Beauv.	Poaceae	October-December
91	*Oryza meyeriana* (Zoll and Mor.) Bail	Poaceae	Throughout the year
92	*Oryza sativa* L.	Poaceae	October-December
93	*Ottelia alismoides* (L.) Pers.	Hydrocharitaceae	October-January
94	*Pandanus fascicularis* Lam.	Pandanaceae	July-October
95	*Panicum repens* L.	Poaceae	November-January
96	*Panicum trypheron* Sch.	Poaceae	August - December
97	*Paspalidium geminatum* (For.) Stapf	Poaceae	July-February
98	*Paspalum conjugatum* Berg.	Poaceae	Throughout the year
99	*Paspalum scrobiculatum* L.	Poaceae	April-Jan.
100	*Pennisetum polystachion* (L.) Sch.	Poaceae	March-October
101	*Phyla nodiflora* (L.) Greene	Verbenaceae	Throughout the year
102	*Pistia stratiotes* L.	Araceae	February-April
103	*Plygonum glabrum* Willd.	Polygonaceae	March-August
104	*Polygonum barbatum* L.	Polygonaceae	October-December
105	*Rhizophora mucronata* Poir.	Rhizophoraceae	November-March
106	*Rhynchelytrum repens* (Willd.) Hubb.	Poaceae	October-November
107	*Rhynchospora corymbosa* (L.) Bri.	Cyperaceae	Throughout the year
108	*Rungia pectinata* (L.) Ness. Dec.	Acanthaceae	July-November
109	*Saccharum spontaenum* L.	Poaceae	July-December
110	*Sacciolepis indica* (L.) Chase	Poaceae	October-April
111	*Sacciolepis interrupta* (Willd.) Stapf	Poaceae	February-March
112	*Sarcostemma secamone* (L.) Ben.	Asclepiadaceae	November-March
113	*Scirpus articulatus* L.	Cyperaceae	November-April
114	*Setaria intermedia* Roe. and Sch.	Poaceae	April-August
115	*Setaria verticillata* (L.) P. Beauv.	Poaceae	February-May
116	*Sopubia delphiniifolia* (Roxb.) G. Don.	Scrophulariaceae	October-January
117	*Sporobolus indicus* (L.) R. Br.	Poaceae	October-February
118	*Sporobolus maderaspatanus* Bor.	Poaceae	January-March
119	*Stachytarpheta jamaicensis* (L.) Vahl.	Verbenaceae	Throughout the year
120	*Trapa natans* L.	Trapaceae	October-March
121	*Typha angustata* B. and Chaub.	Typhaceae	March-April
122	*Utricularia exoleta* R. Br.	Lentibulariaceae	March-May
123	*Utricularia aurea* Lour.	Lentibulariaceae	November-February
124	*Vallisneria natans* (Lour.) Hara	Hydrocharitaceae	January-April

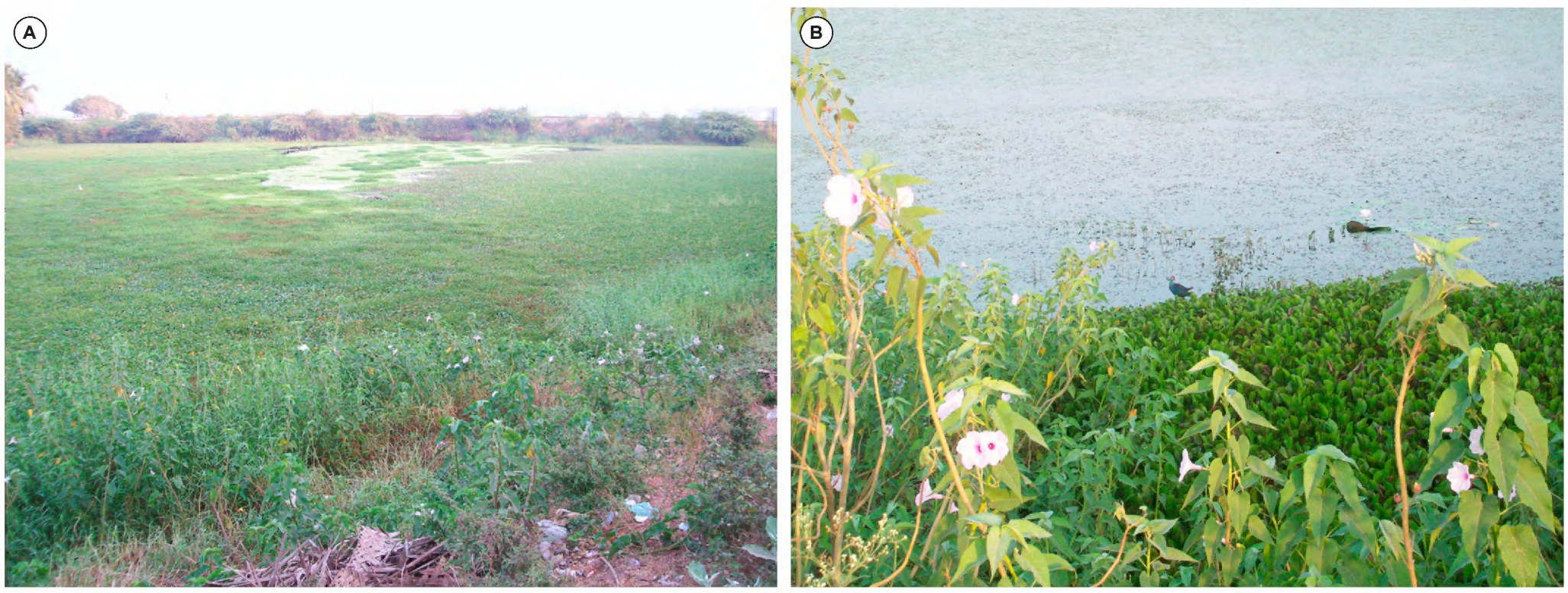

Figure 2. Overview of wetlands in Kanyakumari district. A) Parakkai wetland; B) Thatthiar wetland.

Figure 3. Overview of wetlands in Kanyakumari district. A) Putheri wetland; B) Andarkulam wetland; C) Aerial view of Chunkankadai wetland; D) Vadasery wetland; E) Sand mining in Theroor wetland; F) Manakudy - Mangrove wetland; G) Puthalam-Palkulam wetland.

Figure 4. A) *Nelumbo nucifera* Gaertn. (Nymphaceae); B) *Ottelia alismoides* (L.) Pers. (Hydrocharitaceae); C) *Ipomea aquatica* Forsk (Convolvulaceae); D) *Neptunia oleracea* Lour. (Fabaceae); E) *Hygrophila auriculata* (Sch.) Heine (Acanthaceae); F) *Trapa natans* L. (Trapaceae); *Monochoria vaginalis* (Burm. f.) C. Presl ex Kunth.; G) *Monochoria vaginalis* (Burm. f.) C. Presl ex Kunth.

FIGURE 5. Economic utility of wetlands A) Local man collecting lotus tubers; B) Lotus leaf harvesting; C) Collection of Typha angustata B. & Chaub. for mat weaving.

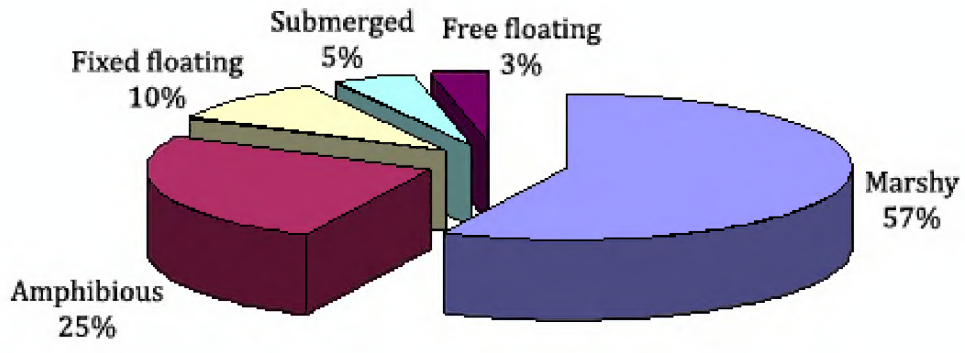

FIGURE 6. Habitat wise distribution of plant species in the study area.

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TABLE 2. List of families with number of genera and species of wetland angiosperms in Kanyakumari district, Tamilnadu, India.

FAMILY RANK	FAMILY	GENERA	SPECIES
1	Poaceae	28	39
2	Cyperaceae	6	24
3	Scrophulariaceae	5	9
4	Commelinaceae	2	5
5	Acanthaceae	4	4
6	Convolvulaceae	2	4
7	Hydrocharitaceae	3	3
8	Verbenaceae	3	3
9	Amaranthaceae	2	2
10	Araceae	2	2
11	Asteraceae	2	2
12	Lemnaceae	1	2
13	Lentibulariaceae	1	2
14	Menyanthaceae	1	2
15	Nymphaeaceae	1	2
16	Onagraceae	1	2
17	Polygonaceae	1	2
18	Pontederiaceae	2	2
19	Apiaceae	1	1
20	Asclepiadaceae	1	1
21	Boraginaceae	1	1
22	Eriocaulaceae	1	1
23	Molluginaceae	1	1
24	Nelumbonaceae	1	1
25	Pandanaceae	1	1
26	Papilionaceae	1	1
27	Podostemaceae	1	1
28	Rhizophoraceae	1	1
29	Rubiaceae	1	1
30	Trapaceae	1	1
31	Typhaceae	1	1

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